

MEALYBUGS (COCCOIDEA: PSEUDOCOCCIDAE) FROM THE AUSTRALIAN NATIONAL BOTANIC GARDENS, CANBERRA

By ¹P. J. Gullan, ²S. R. Donaldson and ¹G. A. Knox*

¹Department of Zoology, Australian National University, Canberra, ACT 2601.

²Australian National Botanic Gardens, Black Mountain, Canberra, ACT 2365.

Abstract

This paper reports on 14 species of mealybugs from eight genera collected from the Australian National Botanic Gardens, Canberra, between January 1981 and March 1984. The appearance in life and habit of the adult female, host-plant associations and plant damage are recorded for each mealybug species.

Introduction

The Australian National Botanic Gardens (ANBG) located on Black Mountain, Canberra, ACT, contain the largest living collection of Australian native plants. Control of coccoids (Coccoidea: scale insects and mealybugs) is a significant horticultural task for the gardening staff. Coccoids are some of the most common nuisance insects in the ANBG and are controlled by utilizing an intergrated method involving predators, parasitoids, pruning, hand removal, or spraying, drenching and injection of the systemic insecticide dimethoate (Rogor 40®).

In 1981, S. R. Donaldson began assembling a reference collection of the coccoids of the ANBG to aid the identification of horticultural pests. Identification and further collection were carried out in collaboration with P. J. Gullan from 1982 to the present. G. A. Knox collected and catalogued specimens and prepared many of the slide-mounts that are essential for species identification. The preserving and slide-mounting techniques of Gullan (1984) were used for all microscopic preparations. Slide-mounted females and dry specimens *in situ* have been deposited in the Australian National Insect Collection, CSIRO, Canberra.

The recent taxonomic revision of Australian mealybugs (family Pseudococcidae) by Williams (1985) greatly facilitated identification of the mealybug species. Williams (1985) also reviews biological information on mealybugs of economic importance. Many of the mealybugs reported in this paper can cause considerable damage to native plants if not controlled.

This paper records the appearance in life and habit of the adult female, host-plant data and plant damage for each of the 14 mealybug species collected in the ANBG between January 1981 and March 1984. Information on natural enemies is included. The botanical nomenclature is that of Beadle, Evans and Carolin (1972) and Willis (1972). The host-plant data augment those available in Williams (1985). Williams (1985) could not examine live females of most Australian mealybug species and therefore the descriptions in this paper supplement his descriptions of slide-mounted females.

* Present address: Department of Industry, Technology and Commerce, Canberra, ACT.

Records

Australicoccus grevilleae (Fuller)

Appearance.—Body of adult ♀ ovoid to sub-globose, dark purple, with a dense white cottony wax covering 0.3-0.5 mm thick; wax-covered ♀ globose, 2-5 mm in diameter.

Habit.—Stationary on stems and in leaf axils, often densely aggregated.

Host plants.—Many *Grevillea* spp., especially *G. arenaria* R.Br., *G. miqueliana* F. Muell. and *G. mucronulata* R.Br. This mealybug has been recorded from many *Grevillea* spp. in NSW, ACT, Vic, SA, WA, and NT (Williams 1985).

Plant damage and natural enemies.—Lack of vigour, reduced flowering, reduced leaf size and leaf number, associated with minor sooty mould; caused damage all year. In the ANBG, neuropteran and coccinellid larvae and two species of hymenopteran parasitoid have been collected or reared from infestations. This mealybug has caused major damage to suburban plantings of *G. rosmarinifolia* A. Cunn. and *G. victoriae* F. Muell., which are frequently used as hedges and screens within the ACT.

Australicoccus hibbertiae (Maskell)

Appearance.—Body of adult ♀ sub-globose, reddish to purple black, with a white granular wax covering 0.1-0.5 mm thick, forming discrete tufts on dorsum of mature specimens and a wax cushion below; wax-covered ♀ globose, 1.5-3.0 mm in diameter.

Habit.—On stems, leaf bases and bases of flowers or fruits, usually occurring singly.

Host plants.—*Hibbertia calycina* (DC.) N.A. Wakefield and *H. stricta* (DC.) R.Br. ex F. Muell. *A. hibbertiae* appears to be confined to *Hibbertia* and has been collected in NSW, Vic and SA (Williams 1985).

Plant damage.—Minor lack of vigour in *H. calycina*, but this plant occurs naturally in the ANBG. Minor defoliation of *H. stricta*.

Dysmicoccus anicus Williams

Appearance.—Body of adult ♀ oval, flattish, 2.0-3.2 mm long, grey, segments distinct, covered with white powdery wax, bearing robust lateral wax filaments 0.1-0.3 mm long and 4 (2 pairs) robust caudal filaments 0.5-1.7 mm long and about 0.2 mm thick.

Habit.—In crevices of distorted growth or 'witches broom' caused by a rust belonging to *Uromycladium*.

Host plants.—*Acacia implexa* Benth. and *A. melanoxylon* R.Br. This species has been recorded from *Acacia* spp. in Qld, ACT and SA and from the bark of *Eucalyptus camaldulensis* Dehnh. in SA (Williams 1985).

Plant damage.—Unknown, usually associated with damage caused by other agents.

Dysmicoccus banksi Williams

Appearance.—Body of adult ♀ elongate oval, flattish, 2-3 mm long, grey, segments distinct, covered with white powdery wax forming indistinct dorsal longitudinal stripes and bearing slender lateral wax filaments 0.1-0.2 mm long and 4 (2 pairs) slender caudal filaments up to 2 mm long but less than 0.1 mm thick.

Habit.—On stems, in large numbers in warm weather.

Host plant.—*Acacia verticillata* (L'Hérit.) Willd. This mealybug has been collected from NSW, ACT and Vic only on *Acacia* spp. (Williams 1985). It has not previously been recorded on *A. verticillata*.

Plant damage.—Minor lack of vigour and minor sooty mould.

Erium globosum (Maskell)

Appearance.—Body of adult ♀ sub-globose, pinkish tan, covered by a thick white waxy secretion about 1 mm deep; wax-covered ♀ globose, 3-6 mm in diameter.

Habit.—On stems, often densely aggregated.

Host plants.—*Acacia howittii* F. Muell., *A. mucronata* Willd. ex Wendl. and *A. oxycedrus* Sieber ex DC. The present data and those of Williams (1985) show that *E. globosum*

has been recorded from seven species of phyllodinous wattle in ACT, Vic, SA and WA. There are no records from bipinnate wattles.

Plant damage and natural enemies.—Major lack of vigour, reduced flowering and caused defoliation on mature foliage. The larvae of *Cryptolaemus montrouzieri* Mulsant (Coccinellidae) controlled this mealybug in the ANBG during warmer months.

Maconellicoccus australiensis (Green and Lidgett)

Appearance.—Body of adult ♀ ovoid, 1.5-3.5 mm long, light grey brown, lightly covered with white powdery wax, body segments distinct due to aggregation of wax in deep intersegmental grooves in three dorsal longitudinal bands, producing a striped appearance.

Habit.—On stems, foliage and young seed pods, often heavily infesting branches. Host plants.—*Acacia drummondii* Lindl, spp. *elegans* and *A. melanoxylon* R.Br. This mealybug has been recorded from many *Acacia* spp., both bipinnate and phyllodinous, in Qld, NSW, ACT, Vic and SA (Williams 1985).

Plant damage.—Frequently caused shoot distortion and dieback. Brookes (1971) discusses damage caused by this mealybug.

Melanococcus senticosus Williams

Appearance.—Body of adult ♀ oval, dorsally convex with abdomen slightly concave ventrally at maturity, 2.0-3.5 mm long, dorsum green, venter black, segmentation distinct, powdery wax sparse and almost absent dorsally, confined to margins of body and abdomen ventrally. No ovisac produced. Immature ♀ grey.

Habit.—On rhachides and pinnae of bipinnate leaves; infestation normally heavy.

Host plant.—*Acacia dealbata* Link. The only other record of this mealybug is from the phyllodinous wattle *A. podalyriifolia* Cunn. ex G. Don in Qld (Williams 1985).

Plant damage and natural enemies.—Little effect on vigour and no shoot distortion despite high density. In the ANBG, the coccinellid predators *Cryptolaemus montrouzieri* and *Paraprius australasiae* (Boisduval) have been associated with an infestation and meat ants, *Iridomyrmex purpureus* (F. Smith), have been observed attending mealybugs to obtain honeydew.

Nipaecoccus ericicola (Maskell)

Appearance.—Body of adult ♀ oval, dorsally convex, becoming ovoid to sub-globose at maturity, 1.5-2.8 mm long, claret to purple-black coloured, with white sparse powdery wax dorsally and squat lateral wax filaments, 0.1-0.2 mm long, on abdominal segments, longest on anal lobes. Ovisac produced ventrally, composed of white glassy wax filaments.

Habit.—Mostly in axils of leaves and flowers or at shoot apices; very mobile.

Host plants.—*Hibbertia obtusifolia* DC., *Persoonia pinifolia* R.Br., *P. linearis* (Andr.) x *P. pinifolia*, *Phebalium stenophyllum* (Benth.) Maiden and Betche, *Prostanthera lasianthos* Labill. and *Westringia longifolia* R.Br. This common and widespread species has been recorded from Qld, NSW, ACT, Vic, SA and Tas on host-plant species belonging to 10 families (Williams 1985). Collection of this mealybug on *Phebalium* in the ANBG adds an eleventh host-plant family (Rutaceae) to this list.

Plant damage. Shoot distortion and fruit abortion.

Nipaecoccus exocarpi Williams

Appearance.—Body of adult ♀ ovoid, purplish, covered in white wax with distinct tufts laterally and irregular aggregations dorsally, cuticle barely visible. Ovisac pale yellow, produced ventrally, most conspicuous posteroventrally, composed of glassy wax filaments; ♀ plus ovisac 2-3 mm long.

Habit.—Along branchlets, usually near tips.

Host plant.—*Exocarpos cupressiformis* Labill. This mealybug has been recorded only from *Exocarpos* spp. in the ACT and Vic (Williams 1985).

Plant damage and natural enemies.—Lack of vigour and sectional death of branchlets.

In the ANBG a coccinellid predator, *C. montrouzieri*, and a dipteran parasitoid, *Meliscaeva* sp., are natural control agents.

Planococcus citri (Risso)

Appearance.—Body of adult ♀ oval, flattish, 1.5-3.0 mm long, yellow, covered in white powdery wax, with lateral wax filaments 0.1-0.5 mm long and up to 0.1 mm thick; pair of caudal filaments not appreciably longer than others, but robust and up to 0.8 mm long. Ovisac produced posteroventrally, composed of white glassy filaments. This species can easily be confused with *Planococcus pacificus* Cox (Cox 1981) which has not been collected in the ACT.

Habit.—On all plant parts. Mostly confined to glasshouses in the ANBG.

Host plants.—Very wide range in the ANBG. This cosmopolitan species is polyphagous (see Williams 1985).

Plant damage.—Severe if unchecked.

Pseudococcus chenopodii Williams

Appearance.—Body of immature adult ♀ oval, grey with sparse covering of powdery wax and lateral and caudal wax filaments.

Habit.—On stems near flower buds.

Host plant.—*Phelbium stenophyllum* (Benth.) Maiden and Betche, but probably an accidental occurrence. Williams (1985) records this species from NSW and SA apparently feeding exclusively on members of the plant family Chenopodiaceae. Only one collection of two adult specimens of *P. chenopodii* has been made in the ANBG, however these were found on a member of the Rutaceae. Plants of *Chenopodium album* L. grow in the vicinity of the collection site and the mealybugs may have been wandering on a non-host plant.

Plant damage.—None apparent.

Pseudococcus hypergaeus Williams

Appearance.—Unknown since the 2 specimens collected were preserved without record of their appearance in life.

Habit.—On young stems.

Host plant.—*Persoonia pinifolia* R.Br. Williams (1985) records *P. hypergaeus* from Qld, NSW, Vic, SA, Tas, and NZ on 12 host-plant genera, including *Persoonia*, in 7 families and notes that there is some variation amongst specimens presently assigned to this species.

Plant damage.—None apparent.

Pseudococcus longispinus (Targioni Tozzetti)

Appearance.—Body of adult ♀ oval, flattish, 2.0-3.5 mm long, pale yellow to ochre, covered in white powdery wax, with lateral wax filaments 0.2-1.0 mm long, length increasing posteriorly, and up to 0.1 mm thick; 2 pairs of long caudal filaments 0.1 mm thick with anal lobe pair up to 3 mm long.

Habit.—On all plant parts, usually in large numbers. Mostly confined to glasshouses in the ANBG.

Host plants.—Very wide range in the ANBG. *P. longispinus* has been recorded from numerous host plants in Qld, NSW, ACT, Vic, SA, Tas and WA and "is probably one of the commonest Australian mealybugs, found on numerous host plants in greenhouses and in the open, especially on pears, grape-vines and *Citrus*" (Williams 1958, p. 317).

Plant damage.—Extensive if unchecked. See Williams (1985) for discussion of the economic importance of this mealybug in Australia.

Pseudococcus sp.

This undescribed species will be formally named and described elsewhere.

Appearance.—Body of adult ♀ elongate oval, flattish 2.0-2.8 mm long, pale yellow to

pale salmon colour when mature, sparsely covered in white powdery wax, with lateral wax filaments 0.1-0.7 mm long, decreasing in length from posterior to anterior of body and 4 (2 pairs) robust caudal filaments up to 1.6 mm long and 1.0-1.5 mm thick, with anal lobe pair thickest. Immature ♀ greyish.

Habit.—In folds of leaves prior to leaf opening, predominantly at leaf bases.

Host plant.—*Xanthorrhoea australis* R. Br. ssp. *australis* (family Xanthorrhoeaceae). This is the first record of a mealybug on *Xanthorrhoea*.

Plant damage.—Chlorosis and mild pitting sometimes occurred.

Acknowledgements

We wish to thank the Director of the Australian National Botanic Gardens for permission to collect and study coccoids, Doug Williams of the Commonwealth Institute of Entomology, London, for assistance with several mealybug identification, Tom Weir and Don Colless of the Division of Entomology, CSIRO, Canberra, for identification of the coccinellid species and the dipteran parasitoid, respectively, and Dr J. A. Armstrong and a referee for their comments on the manuscript. This work was supported by a grant from the Faculties' Research Fund, of the Australian National University, Canberra.

References

- Beadle, N. C. W., Evans, O. D. and Carolin, R. C., 1972. *Flora of the Sydney region*. A. H. and A. W. Reed, Sydney, Wellington and London. 724 pp.
- Brookes, H. M., 1971. Two species of *Eurycoccus* Ferris on *Acacia* in Australia (Homoptera: Pseudococcidae). *J. Aust. ent. Soc.* 11: 129-134.
- Cox, J. M., 1981. Identification of *Planococcus citri* (Homoptera: Pseudococcidae) and the description of a new species. *Systematic Entomology* 6: 47-53.
- Gullan, P. J., 1984. A revision of the gall-forming coccoid genus *Apiomorpha* Rübсаamen (Homoptera: Eriococcidae: Apiomorphinae). *Aust. J. Zool., Suppl. Ser.* No. 97: 1-203.
- Williams, D. J., 1985. *Australian mealybugs*. British Museum (Natural History), London. 431 pp.
- Willis, J. H., 1972. *A handbook to plants in Victoria*. Volume II. Dicotyledons. Melbourne University Press, Carlton. 832 pp.

BOOK REVIEW

Plant virus epidemics: monitoring, modelling and predicting outbreaks.
 Editors G. D. McLean, R. G. Garrett and W. G. Ruesink. 1986.
 Academic Press Australia, 30-32 Sidmore St, Marrickville, N.S.W. 2204.
 ISBN 0 12 485060 X. xxi, 550 pages, illustr.

It is indeed pleasing to see this book; as the Forward states "There has been no previous book devoted to this largely neglected topic . . . The extent of the work done and the progress made will come as a revelation to many readers as much of the information had previously appeared in a fragmented or inaccessible form".

24 papers are included, arranged in 4 main sections: Monitoring (8 papers), Modelling (8 papers), Predicting (6 papers) and Control (2 papers). In addition, the first and last papers form a prologue and epilogue. Of the 40 authors (from four continents) 15 are Australian, and all are prominent in their fields.